

REMARKS

The present invention is directed to a multi-layer laminated circuit board that incorporates an in-built multi-layer transformer wherein the core is formed by sheets of the lamination without the use of a paste or epoxy and further the dielectric coating over the windings are also conveniently formed by sheets without utilizing a paste.

The use of solid sheets of magnetic material and dielectric material permits a uniformity in film thickness while ensuring a constant insulating property between the primary windings and the secondary windings of a transformer. The dielectric sheets can be formed smaller than the magnetic sheets so that when the stack of dielectric sheets and magnetic sheets are contacted and pressed together, the dielectric sheets can be interposed between the primary winding and the secondary winding to provide excellent insulation properties while magnetic flux leakage can be suppressed by a constant thickness of magnetic material forming a core with a peripheral magnetic frame aligned with the edge of the dielectric sheets. As a result, there will be very little distortion on the peripheral edges and in the center of the dielectric sheet, which can facilitate the manufacturing process and provide an improvement in the magnetic saturation characteristics.

Since it is contemplated that a large number of laminated dielectric sheets can be utilized along with a larger number of plurality of magnetic sheets. A relatively sturdy construction can be created and any resulting wiring sheet that is laminated onto the multi-layer transformer can be reliably attached.

As can be appreciated from the various embodiments, the magnetic frames can be die cut to accurately juxtaposition the cores, for example as shown in the embodiment of Figure 7, the magnetic frames in 139A, 139B with the corresponding centrally located cores 140A, 140B. As can be seen in this embodiment, the magnetic sheets including the magnetic frames are

somewhat larger so that when compacted together as shown in Figure 8, a sturdy perimeter frame of magnetic material can be realized.

Thus, the present invention utilizes a lamination technique to provide a multi-layer laminated circuit board with an in-built multi-layer transformer as specifically claimed in our amended claims herewith.

The Office Action raised an issue with multiple dependent claims under MPEP §608.01(n). These claims have now been appropriately amended and as can be appreciated, provide additional definitions of the invention neither suggested nor taught by the cited references of record.

The Office Action rejected Claims 1-3 as being anticipated under 35 U.S.C. §102(b) by *Peels et al.* (U.S. Patent No. 6,573,321).

As can be appreciated by the cited and applied art, this is a relatively crowded field with a large number of international companies attempting to miniaturize and improve the performance of electronic components in an economical manner to provide a competitive edge. Accordingly, the United States Patent Office should take this competitive environment into account when reviewing the current claims.

“Thus when differences that may appear technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light.”

Continental Can Co. USA Inc. v. Monsanto Co., 20 U.S.P.Q. 2d. 1746, 1752 (Fed. Cir. 1991).

The *Peels et al.* reference was directed to a print circuit board that would be suitable for the transfer of a charging power and a switch mode power supply. See Column 1, Lines 46-51.

Consumer devices, such as a mobile phone or an electric toothbrush, could be appropriately charged by providing a transformer where a primary part of the transformer would be integrated into a charger device or base and a secondary part would be integrated into the user device such as the toothbrush. When the toothbrush is mounted on the base, a contactless charging operation takes place by an air coil principle. See, for example Figure 5.

Referring to Figure 1, the primary winding in the transformer elements 4, 6 and 23, and the secondary winding 5, are purposely divided by an insulating dielectric sheet or layer 7 that is to project outwardly by 2.5 mm beyond the first and second magnetic layers 2 and 3. See Column 6, Lines 62-67.

The printed circuit board 10 also contemplates a screening layer 24 of copper and an intermediate layer of an electrically insulating material between the outer surface 11 and the first magnetic layer 2.

A second embodiment discloses not only the vias for forming connections for windings, but also a channel 8 forming a hole which is to be filled with a liquid mixture of an organic material and a filler of magnetic material. See Column 7, Lines 23-36.

Thus, it is contemplated that laminate sheets would be supplemented with a liquid epoxy. Referring to our amended Claim 1, we define a multi-layer transformer formed by lamination when a plurality of magnetic sheets are laminated to form a core that can be aligned with a central hole in the dielectric sheets of the primary and secondary windings while a magnetic frame portion surrounds the peripheral edge of the dielectric sheets.

A cover of magnetic layer portions can sandwich the dielectric sheets and can contact with each other via the magnetic core portion and the magnetic frame portion. The *Peels et al.*

reference does not teach these features, nor would such features be suggested to a person of ordinary skill in this field.

Accordingly, it is respectfully submitted that the *Peels et al.* reference, as prior art anticipation, would not teach the features set forth in the present amended claims in accordance with MPEP §2141.02 VI.

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would be lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

MPEP 2141.02 VI

The dependent claims add additional features which are neither suggested nor taught by the *Peels et al.* reference.

The Office Action also cited *Itou et al.* (U.S. Patent No. 6,998,951) which disclosed a choke coil array with two spiral coils arranged in a side by side manner. The *Itou et al.* reference does not provide any more relevant disclosure than the applied *Peels et al.* reference, and would not render obvious the present claims.

Finally, *Hong et al.* (U.S. Patent No. 6,917,274) was cited of interest, and this also disclosed a stacked coil device. As can be appreciated, this reference also does not disclose the features of a magnetic frame peripheral perimeter and its relationship with dielectric layers, as defined in our current claims.

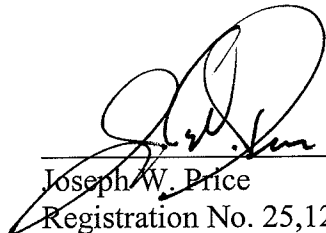
Hong et al., accordingly, is no more pertinent than the *Peels et al.* reference to the present claims.

Applicant submits that the features of our invention have now been defined in our amended claims and believes that the present invention is patentable over the art of record.

If the Examiner believes a telephone interview will assist in the prosecution of this matter, the undersigned attorney can be contacted at the listed phone number.

Very truly yours,

SNELL & WILMER L.L.P.



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